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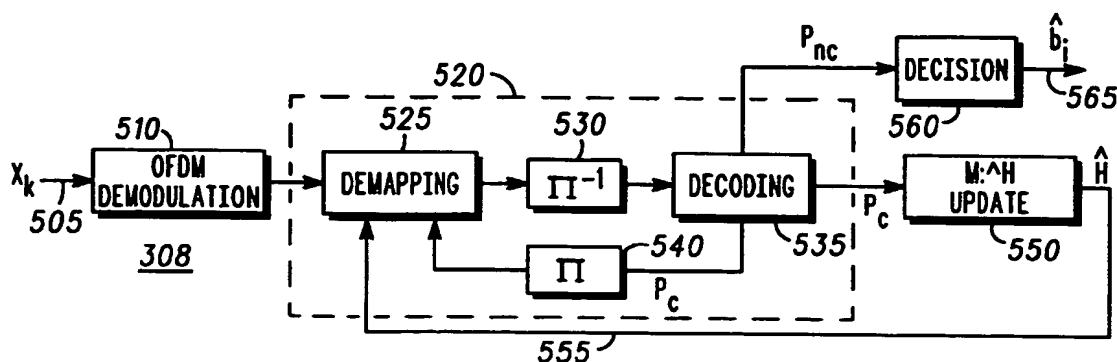
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(54) Title: ITERATIVE CHANNEL ESTIMATION IN MULTICARRIER RECEIVERS



(57) Abstract: A method of channel estimation comprises the steps of receiving a signal and applying a fast fourier transform (FFT) to obtain a plurality of frequency domain sub-carriers. Probabilities of coded bits are produced and channel coefficient estimation is performed for each of the plurality of frequency domain sub-carriers using channel coefficient estimates of other ones (preferably all others) of the plurality of frequency domain sub-carriers, which are based on the probabilities on coded bits. An OFDM communication unit and OFDM communication system are also provided.

INTERNATIONAL SEARCH REPORT

PCT/EP 03/50774

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L25/02 H04L27/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

PAJ, WPI Data, EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PANAYIRCI, ÇIRPAN: "Maximum a posteriori multipath fading channel estimation for OFDM systems" EUROPEAN TRANSACTIONS ON TELECOMMUNICATIONS, vol. 13, no. 5, September 2002 (2002-09), pages 487-494, XP001133082 Milan, IT * section 4 *	1-12

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

PCT/EP 03/50774

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	XIANGYANG ZHUANG, VOOK: "Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm" IEEE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING, 13 - 17 May 2002, pages 2337-2340, XP001148757 2002, Piscataway, NJ, USA, IEEE, USA * section 4 *	1-12
X	JAFFROT, SIALA: "Turbo channel estimation for OFDM systems on highly time and frequency selective channels" IEEE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING. PROCEEDINGS, 5 - 9 June 2000, pages 2977-2980, XP002171257 New York, US cited in the application * section 6 *	1-12
X	EP 1 154 602 A (LUCENT) 14 November 2001 (2001-11-14) abstract; figure 8	1-5,7-12
A	WO 99/60940 A (GLENAYRE ELECTRONICS) 2 December 1999 (1999-12-02) abstract	1,12

INTERNATIONAL SEARCH REPORT

PCT/EP 03/50774

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 1154602	A	14-11-2001	EP	1154602 A1	14-11-2001
WO 9960940	A	02-12-1999	US	6173011 B1	09-01-2001
			AU	4201899 A	13-12-1999
			CA	2333527 A1	02-12-1999
			CN	1305356 T	25-07-2001
			EP	1079758 A1	07-03-2001
			WO	9960940 A1	02-12-1999